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CHOLERA.

PRIVY COUNCIL AND LOCAL GOVERNMENT BOARD.

R E P R I N T S

FROM

REPORTS OF THE MEDICAL DEPARTMENT,

FOR THE

Years 1865-66 and 1873.

With Preliminary Report by the Medical Officer, 1884.



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Preliminary Report by the Medical Officer to the President of the Local Government Board.

To the RIGHT HON. CHARLES WENTWORTH DILKE, Bart., M.P.,
&c., &c., President of the Local Government Board.

SIR,

THE present reprints are intended to serve a double purpose. The extracts from the reports of the Medical Officer exhibit, at greater length than in a memorandum, the doctrines concerning cholera in Europe which have been continuously held by the principal medical advisers of the English Government. We may believe that they are commanding more and always more adherents among sanitary authorities on the continent, though hitherto they have not obtained sufficient recognition in practical effort. The extracts from reports of Medical Inspectors on the other hand are primarily intended for the assistance of those who may have to deal with local conditions provocative of cholera or with any outbreak of the disease in England. It is hoped that both series of extracts may at the present moment be of service as indicating the true lines of preventive action against the disease which is now threatening Europe.

For public use in this country the all-important principle of cholera prevention is, that "cholera derives all its epidemic destructiveness from filth, and specially from excremental uncleanliness" and "the local conditions of safety are, above all, these two : (1) that by appropriate structural works all the excremental produce of the population shall be so promptly and so thoroughly removed, that the inhabited place in its air and soil shall be absolutely without faecal impurities ; and (2) that the water supply of the population shall be derived from such sources and conveyed in such channels that its contamination by excrement is impossible."

If the appearance of cholera should be in any population the signal for panic and flight, I venture to say that it would be because such population had not clearly recognised this principle, and had not secured these essential conditions of safety.

On the above quoted words of Mr. Simon, written nearly 20 years ago and embodying the experience of nearly 20 previous years, I have to-day only one observation to make. His words were written when local sanitary authorities in England had seldom begun their work ; when port sanitary authorities had made no provision for dealing with imported disease ; and when special orders in face of cholera were requisite in order to give such powers as those authorities have now long possessed as

standing defences against all infectious diseases. We may be confident that in proportion as the sanitary authorities of England have done their regular work, and exercised their ordinary powers for the protection of the public health, the country has now even less to fear from cholera than in former invasions of Europe by the disease.

The extracts from reports of Medical Inspectors relate to certain local appearances of cholera in England during the years 1865-66. Longer and more comprehensive reports are not here reproduced; some matters of merely passing interest are omitted from the reprints, and I have regarded as foreign to my present object any illustrations of what may be done to stay an already developed epidemic. The specimen reports relate to occurrences of cholera at Theydon-Bois, in Southampton, on Irish mail steamers, at a village near Bristol, and among migrating foreigners passing through English ports. Thus they show cholera making its appearance under a variety of circumstances, and they afford some instructive instances, first of the customary, though sometimes obscure, relationship of cholera with foul water or air; secondly of the way in which the disease has been restricted to the locality of its first appearance and has rapidly become extinguished there.

I have the honour to be,
Sir,

Your obedient Servant,

GEORGE BUCHANAN.

July 14, 1884.

Extracts from Reports of the Medical Officer of the Privy Council and of the Local Government Board.

A. Extract from the Report (1865) of the Medical Officer of the Privy Council (Mr. Simon).

The choleraic infection of Egypt in May 1865, with the return of Mohammedan pilgrims from Mecca where the disease was epidemic ; followed soon afterwards by the spread of the same infection, along each of the several lines of steamboat communication which diverge from Alexandria as a centre, to all the most considerable ports of the Levant and of southern Europe ; whence again in many instances inland spreadings of the disease took place ;—this constituted a succession of events which augured badly for the public health in England. And presently, in the quarter where it was being looked for, a first wave of the infection had touched our shores, though happily not yet greatly to harm us. For the first time in our experience of cholera, the attack was on our south coast ; not as on former occasions on our ports which look towards the Baltic : but on Southampton, distinguished among all our ports as the one of quickest Mediterranean traffic, and perhaps also (though this may have been secondarily) on Weymouth or Portland or Dorchester.

Asiatic cholera again in Europe.

Of the epidemic progress which I have just summarily sketched, I do not attempt here to give the innumerable and somewhat intricate details, nor to compare the present course of the disease with steps of former visitations. On that subject, under their Lordships' orders, I requested Mr. Radcliffe, honorary secretary of the Epidemiological Society, to compile a special report ; and, for the purpose, I put into his hands all the abundant information which the Foreign Office had communicated to their Lordships. The elaborate report with which he has recently furnished me, gives all information which has hitherto been obtained as to the epidemic progress, compares the present with former invasions, and gives some interesting supplementary information as to the Mohammedan pilgrimages, in their relation to the present subject.

Of the very small share which England has yet had in the epidemic, the main facts are these. Into Southampton there came on July 10th, and at intervals afterwards, very suspicious arrivals from Alexandria, Malta, and Gibraltar. In the middle of August, a young woman in the town had a choleraic attack of doubtful nature ; on the 22nd September a labourer had undoubted Asiatic cholera, of which afterwards he died ; and from then, for about six weeks, cholera-cases continued to occur in small numbers in and about Southampton, so that on the 4th November (when the little epidemic might be considered at an end) there had been in all 60 such cases, of which 35 had terminated in death.

It is a question whether from Southampton, or in any more direct way, the morbid influence may in August or September have reached Weymouth or Portland or Dorchester : I have no proof that any such infection took place ; but accidentally I am informed that a gentleman from a distance who early in August was spending a week in Weymouth, and visiting both Portland and Dorchester, contracted during that week a diarrhoea which on his return home developed to severe cholera ; and in September there occurred, in the neighbourhood of London, the following events, which give peculiar interest to the question. Mr. G. and his wife, inhabitants of Theydon-Bois near Epping, had been lodging at Weymouth for 17 days from the 8th September, had visited Portland

on the 22nd, and Dorchester on the 23rd, and returned home on the 25th. On the evening of the 23rd Mr. G. had been seized with diarrhœa, sickness and cramps, which continued more or less through the next day, and left him still unwell on the morning of the 25th. He, however, performed his journey to Epping with his wife. She, during the journey, began also to complain of abdominal discomfort; and this, after her return, developed, with gradually increasing diarrhœa, to cholera, of which (in its secondary fever) she eventually died on the 11th October. On the 30th September (while the last-named patient was still in collapse) one of her daughters, aged eight, was seized with cholera, and in a few hours died. That same night, a serving lad in the house was seized with cholera, and barely escaped with his life. On the 2nd October, the doctor who was attending them died of cholera, after 10 hours' illness. On the 3rd, another daughter of the house, aged 16, passed into cholera, but eventually after some consecutive fever, recovered. On the 5th, a maidservant got diarrhœa, which, though relieved for the time, relapsed and became choleraic on the 8th, and she, after some promise of recovery, fell into secondary fever, with which she eventually died. On the 5th also a labourer who worked on the premises, but lived apart, was taken with diarrhœa, which, passing on to cholera and collapse, killed him next day but one. On the 6th, the head of the house, the Mr. G. who had suffered at Weymouth, and had ever since had relaxed bowels, got a very acute new attack, and died after 15 hours. On the same day his son was attacked with diarrhœa, and next day was in collapse, but rallied, and finally got well. Also on the 6th, the grandmother of the house was similarly attacked; and she, though she emerged from collapse, eventually died on the 14th. On the 10th a woman, living near by, whose only known connexion with the above cases was that on the 8th she had assisted in laying out the dead body of the above-mentioned labourer, was taken with choleraic purging, which soon led to collapse, and next day to death. Thus, within a fortnight, in that one little circle, eleven persons had been attacked with cholera,—mother, father, grandmother, two daughters, son, doctor, serving lad, servant maid, labourer, and country-woman; and, of these eleven, only three survived—the son, a daughter, and the serving-lad. Later, in the country-woman's family, there was another fatal case. It cannot well be doubted but that the exciting cause of this succession of events was, in some way or other, the return of the parents from Weymouth—of the father with the remains of choleraic diarrhœa still on him, of the mother with apparently the beginnings of the same complaint. But this is only part of the case, and the remainder teaches an impressive lesson. All drinking-water of the house came from a well beneath the floor of the scullery; and into that well there was habitual soakage from the water-closet. Whether, in intimate pathology, there are any essential differences between the cholera which kills on a large scale, and the cholera which kills single victims, is hitherto so entirely unknown that it would be idle to discuss, as a separate question, whether the G. illness, contracted at Weymouth and carried to Epping, was "epidemic" or "sporadic," "Asiatic" or "English," cholera; and, as above stated, I cannot prove it to have been an offshoot of the Southampton epidemic, or otherwise of Mediterranean origin. Certain, therefore, only is this:—that, from the time when Mr. and Mrs. G. returned ailing to their home, the discharges which passed from their bowels gave an additional and peculiar taint to the already foul water-supply of their household, and that thenceforth every one who drank water in the house drank water which had in it the ferment of decomposing diarrhœal matters.

In relation to these, on the whole, inconsiderable manifestations of epidemic cholera in England, proceedings under directions of the Lords of the Council were taken as follows. With the assistance of Dr. Parkes, Professor of Military Hygiene at Netley Hospital, I watched the progress of the epidemic at Southampton, and addressed to the local authorities such suggestions as were necessary. And as soon as information came of the lamentable occurrence at Theydon-Bois (which unfortunately was not until all the above described mischief had been accomplished) I instructed Mr. Radcliffe to investigate the facts, and to give such advice as might be useful. Professor Parkes made peculiarly exact inquiry into all the circumstances connected with the beginnings of the epidemic in Southampton, and into the relations of the cases to one another; and I append his report *in extenso**; not only for the positive information which it contains, but also as an useful illustration of the extreme difficulty which in all such matters there is in proving or disproving contagious relations. From Mr. Radcliffe's report I append† the section which describes in detail the circumstances of the infected water-supply.

B. Extracts from the Report (1866) of the Medical Officer of the Privy Council (Mr. Simon).

A year ago, when making my report for the year 1865, I had to state that, during the period then reported on, cholera had once more become widely prevalent in Europe, and had already, though but in very small extent, shown itself in this country. As matter of anticipation it was then scarcely less than certain that the year 1866 would not come to an end without cholera having been seen here in much larger amount. And that antecedent probability has now been justified by the result. We suffered during 1866 very considerably from the disease; and even yet it would be premature to say that our share of suffering from the present fourth extension of Asiatic cholera is at an end.

The history of the disease in England in 1866, and of the proceedings taken by my Lords in relation to it, is, briefly, and so far as the facts came before this department, as follows.

On the 28th of April a first case was reported from Bristol, that of a trader who had arrived there sick from Rotterdam.

On May 15th telegrams from Liverpool and Birkenhead reported that the disease was prevailing on board certain vessels in the Mersey among German and Dutch emigrants, who, with a view to crossing the Atlantic for New York, had come in flocks, travelling rapidly from the continent, often from infected parts of it, by way of Hull, Grimsby, and other of our north-eastern ports, and had now fallen ill at their port of embarkation. Much alarm was occasioned by this outbreak; the more, as new arrivals of the same sort were occurring from day to day; and my Lords, under the circumstances, thought it expedient to put the Diseases Prevention Act in force for the endangered places. An inspector was also sent down to advise and assist as might be necessary; and the authorities acted with vigour and judgment. The outbreak, so far as England was concerned, soon came to an end; but the subsequent progress of the emigrants was unfortunately not unattended by cholera. Indeed, in several cases, vessels such as the above, leaving in apparent health, suffered during their voyage cholera-deaths among their passengers and crew, and were of course very dangerous arrivals for their port of destination.

Rise and progress of cholera in England in 1866.

* Not reproduced in this reprint.

† Page 14 of these papers.

Within the next few days after the 15th my Lords were apprised of the first two cases of what afterwards became a serious epidemic at Swansea; and single cases in various other parts of the country were also notified to them. Anxiety became general in the country; and there was much correspondence with local authorities, often on precautions to be taken against the disease, or provisions to be made for treating it, and often on questions of jurisdiction and responsibility.

On June 15 my Lords were informed that the Peninsular and Oriental Company's steamship "Poonah" had arrived at Southampton with a case of cholera on board, and that several other cases had appeared in the town. On the 29th two deaths were reported by telegram to have happened at Goole, whither clearly the disease had been imported from Antwerp. On the 30th three deaths were reported to have occurred at Northwich in Cheshire, and on the same day a case of cholera occurred at Shields on board the *Clio*, from Hamburg. On July 3rd a case was reported to have happened at Harwich, on board the "Redstart," from Brussels; and on the same day, from Brixham, the death of the captain of a coasting vessel was reported.

Evidently England was now being infected in many different directions, and could hardly hope to escape a serious extension of the disease. Reports of new centres of infection became more and more frequent; and on July 14th my Lords felt that the time had come for putting the Diseases Prevention Act in force throughout the whole of England and Wales. They accordingly now issued their Order for that purpose. And henceforth ample powers of medical relief (not restricted to paupers) were exercisable by local authorities throughout the country.*

* * * * *

Present practical
knowledge of
cholera.

With the present opportunity of adding a few supplementary remarks to my report, and particularly with the results of the Weimar conference before me, I am led to consider once more whether the additions, which our previous knowledge of cholera has hitherto during this epidemic received, are such as to change in any respect the principles on which I have heretofore advised against cholera, or in any way to require that I should make other practical recommendations than those which were last year issued from this department, and are now subjoined in my Appendix No. 5. After giving to this question the best consideration in my power, I answer it, though with very mixed feelings, confidently in the negative.

Medical treat-
ment of cholera.

Doubtless it is lamentable that one should still have to speak almost with despair of the medical treatment of developed cholera. But so it is. The task continues to be, as from our first acquaintance with the disease it has been, an almost hopeless task for the practitioner. The experience of renewed epidemics, the studies of 35 years, have in this respect done little more than warn us from various kinds of hurtful activity, and teach us that at present our utmost power is but perhaps some very little ability of palliation. In the treatment of incipient cholera, there might certainly seem more room for hope; but competent physicians are not agreed that even here there art has much true efficiency against the disease. Practically then, more and more, as facts like the above become notorious, the business of resisting cholera on any large scale resolves itself into aims of prevention. And in contrast with the powerlessness of curative medicine, the preventive power which we possess is among the happiest possessions of science.

* The further history of the epidemic of 1866 and the report of its extension over East London are not reprinted here.

Yet here, as in the former respect, though for reasons which are widely different, I have again nothing new to advise. That which for public use in this country I believe to be, without any shadow of doubt, now as for long past years, the all-important principle of cholera-prevention: the principle that, for us, cholera derives all its epidemic destructiveness from filth, and specially from excremental uncleanness: this of course may be iterated and re-iterated, with new and newer illustrations, but the utmost prominence which I can give to it was given in my last year's memorandum, and new knowledge neither permits me to express myself less strongly on the subject, nor enables me to express myself more strongly, than I have done even years and years ago.

Prevention of
cholera.

The doctrine of the cholera-fungus—the alleged discovery that the specific zymosis of cholera, the bowel-fermentation in respect of which it is contagious, has essentially associated with it, and perhaps as its immediate cause, a definite multiplying organic form, is not only of the utmost philosophical interest, but, should it be substantiated, may also hereafter be found capable of very important practical application. For as one reflects on the doctrine in all its bearings, specially as one considers Professor Hallier's conjecture (based on botanical considerations) that perhaps the cylindrotæmium is originally a blight of rice something like a clue is for the first time suggested for investigations which may hereafter conduce to the prevention of cholera in its eastern centres of origination. But for us in Europe, meanwhile, the doctrine may be absolutely sterile of results. In its broad signification, indeed, the discovery would not be a surprise to pathologists. The possibility has for some years past been recognised that perhaps every fermentatory or putrefactive change of organic material has with it, and may be as its cause, a characteristic molecular living thing;* and, however sure it may have become that the choleraic zymosis answers to that possibility, it remains yet untried whether disinfection (which after all is but a doubtful resource) can deal better with the process on that basis than on the purely chemical basis which has hitherto been the ground of our proceedings.†

In the long chain of cause and effect through which the rise of a certain ferment in India becomes the predestining force for subsequent outbreaks of pestilence in Europe, we see at present only one link where we may strike with the certainty of preventive effect. Whatever may be the explanation of the fact, at least empirically we know that here in Europe the pestilence rages only where there are definite sanitary evils. This knowledge remains unchanged; and unchanged remain also our practical means of applying it. Between different epidemiologists there may be differences, even strong differences, of opinion, as to the intimate nature of some of the steps by which the Asiatic influence becomes able to operate on the individual dweller in some English town; but practically all would unite in saying that the chain of evil is abruptly broken wherever thorough cleanliness prevails. The details of the contrary condition are beyond measure disgusting to write about; but more disgusting by far it would be that they should continue through not being identified. It cannot be too distinctly understood that the person who contracts cholera in this country is *ipso facto* demonstrated with almost absolute certainty to have been exposed to excremental pollution:

Relation of
cholera in Eng-
land to faults of
drainage and
water-supply.

* See in Sixth Annual Report, pp. 53-4, foot note on the experiments of Schröder and Pasteur, as to the connexion generally of fermentatory and putrefactive changes with the presence of characteristic organisms, and on the interest of these experiments to zymotic pathology.

† [To the bacillar organisms which have more recently been observed in cholera patients, and regarded as being, perhaps, the means of distribution of the disease, it is evident that the above comments must equally apply. 1891.]

that what gave him cholera was (mediately or immediately) cholera-contagium discharged from another's bowels; that, in short, the diffusion of cholera among us depends entirely upon the numberless filthy facilities which are let exist, and specially in our larger towns, for the fouling of earth and air and water, and thus secondarily for the infection of man, with whatever contagium may be contained in the miscellaneous outflowings of the population. Excrement-sodden earth, excrement-reeking air, excrement-tainted water, these are for us the causes of cholera. That they respectively act only in so far as the excrement is cholera-excrement, and that cholera-excrement again only acts in so far as it contains certain microscopical fungi, may be the truest of all true propositions; but whatever be their abstract truth, their separate application is impossible. Nowhere out of Laputa could there be serious thought of differentiating excremental performanees into groups of diarrhoeal and healthy, or of using the highest powers of the microscope to identify the cylindro-tæmium for extermination. It is excrement, indiscriminately, which must be kept from fouling us with its decay.

Prevention of cholera by proper sanitary constructions.

And thus it is that my practical advice remains substantially what it has been for years. The local conditions of safety are, above all, these two:—(1) that, by appropriate structural works, all the excremental produce of the population shall be so promptly and so thoroughly removed, that the inhabited place, in its air and soil, shall be absolutely without fæcal impurities; and (2) that the water-supply of the population shall be derived from such sources, and conveyed in such channels, that its contamination by excrement is impossible.

What good results are got even by rough approximation to those sanitary standards has already been abundantly shown here. The way in which the southern districts of London, with their three fourths of a million of population, have gradually gained comparative immunity from cholera in proportion as their two water-companies have ceased to distribute sewage-tainted water among them, is matter of familiar history. And the results to which I have already referred, as found in various towns where works of drainage and water-supply have been provided, are further illustrations to the same effect.*

C. Extract from the Report (1873) of the Medical Officer of the Privy Council and Local Government Board (Mr. Simon).

I have to report that in 1873, and particularly during much of the second half of the year, Asiatic cholera was more or less prevalent in many parts of continental Europe, and sometimes—as at Paris, Havre, Rotterdam and Antwerp—in places which have constant and easy communication with England. In our relations to cholera on the continent of Europe there are at present some points of interest on which I may have occasion to submit to you a supplementary report: but I need not here do more than refer to the Board's actual proceedings as to cholera during the year on which I am reporting. In July 1873, in view of the then circumstances, the Board issued (instead of an Order which had been issued in 1871 by the Lords of the Council) an amended Order prescribing rules for the detention and examination of ships suspected of choleraic infection, and for dealing with cases of actual

* See p. 15 of these papers.

infection.* The Board also circulated among the local sanitary authorities of England a memorandum which at the Board's desire I had prepared, on the precautions generally proper for local adoption under the circumstances; and particular communications on the subject of local arrangements were also had by the Board with several of the sanitary authorities of ports. In a few cases, namely, three times in the Thames twice at Liverpool, once at Southampton, and at least once at Swansea, the local arrangements were tested by infectious arrivals; and in most of these cases, as well as in several instances of false alarm, local inquiry was made by inspectors from the Medical Department.†

D. Memorandum of Precautions against the Infection of Cholera.

1. The Order of the Local Government Board, of July 12, 1883, now in force, gives certain special powers to the sanitary authorities of the sea coast, enabling them to deal with any cases of cholera brought into port, so as to prevent as far as possible the spread of the disease into the country. But as cases of choleraic infection have widely different degrees of severity, it is possible that some such cases, slightly affected, will, notwithstanding the vigilance of local authorities, be landed without particular notice in English sea-board towns, whence they may advance to other, and perhaps inland, places.

2. Former experience of cholera in England justifies a belief that the presence of imported cases of the disease at various spots in the country will not be capable of causing much injury to the population, if the places receiving the infection have had the advantage of proper sanitary administration; and in order that all local populations may make their

* That order is in effect the same as the orders to Port Sanitary Authorities of 1883.

† In one case, among those which particularly concerned London, the danger was extremely great. On the 28th July, a ship from Hamburg landed at Blackwall a body of 82 Danish and Swedish emigrants, in destination for New Zealand. During the voyage no sort of illness, except sea-sickness, had been noted among them, and therefore no objection to their landing had been raised under the Board's recent Order; but almost immediately afterwards, when to await re-shipment, they had settled themselves in various lodging-houses in Whitechapel, and were legally in the position of ordinary residents in London, it became evident that cholera was among them; and the Board's first information of this state of the case was due to the courtesy of a private medical practitioner who had been called to the sick. As soon as his letter was received by the Board, communication on the subject was had by the Medical Department with the authorities and others who were concerned, and by great exertions of all, under a state of law in which everything depended on voluntary exertions on one side and absence of objection on the other, the emigrants by 31st July (the day on which they were to have been re-shipped for New Zealand) were collected and placed in isolation on the port authority's hospital ship "Rhin" off Gravesend, to remain there under medical care. Then the houses where they had been temporarily lodged, and which meanwhile had been under close observation by the Whitechapel officer of health, Mr. Liddle, were finally disinfected. Of the 82 emigrants, 28 sickened and 8 died; but to our own population there was no extension of the disease. The removal was managed by the emigration agent, to whom the great importance had been explained of getting all the emigrants together into suitable quarters where their state of health could be medically watched and cases of incipient cholera be isolated; but this action, taken by him with the co-operation of the recently appointed able health-officer of the port, Mr. Harry Leach, was without any support from law. That he was able to do as advised, and to do it in such a way as to transfer an immense danger from the heart of London to a comparatively safe distance, was due to the goodwill of the port authority, who made their Gravesend ship available for the relief of Whitechapel; and it seems to me that by acting in that liberal spirit the Corporation of the City helped London out of a serious difficulty.

self-defence as effective as they can, it will be well for them to have regard to the present state of knowledge concerning the mode in which epidemics of cholera (at least in this country) are produced.

3. Cholera in England shows itself so little contagious, in the sense in which small-pox and scarlatina are commonly called contagious, that, if reasonable care be taken where it is present, there is almost no risk that the disease will spread to persons who nurse and otherwise closely attend upon the sick. But cholera has a certain peculiar infectiveness of its own, which, *where local conditions assist*, can operate with terrible force, and at considerable distances from the sick. It is characteristic of cholera (and as much so of the slight cases where diarrhoea is the only symptom as of the disease in its more developed and alarming forms) that *all matters which the patient discharges from his stomach and bowels are infective*. Probably, under ordinary circumstances, the patient has no power of infecting other persons except by means of these discharges; nor any power of infecting even by them except in so far as particles of them are enabled to taint the food, water, or air, which people consume. Thus, when a case of cholera is imported into any place, the disease is not likely to spread, unless in proportion as it finds, locally open to it, certain facilities for spreading by *indirect infection*.

4. In order rightly to appreciate what these facilities must be, the following considerations have to be borne in mind:—*first*, that any choleraic discharge, cast without previous thorough disinfection into any cesspool or drain, or other depository or conduit of filth, infects the excremental matters with which it there mingles, and probably, more or less the effluvia which those matters evolve; *secondly*, that the infective power of cholera discharges attaches to whatever bedding, clothing, towels and like things, have been imbued with them, and renders those things, if not thoroughly disinfected, as capable of spreading the disease in places to which they are sent (for washing or other purposes) as, in like circumstances, the patient himself would be; *thirdly*, that if, by leakage or soakage from cesspools or drains, or through reckless casting out of slops and washwater, any taint (however small) of the infective material gets access to wells or other sources of drinking-water, it imparts to enormous volumes of water the power of propagating the disease. When due regard is had to these possibilities of indirect infection, there will be no difficulty in understanding that even a single case of cholera perhaps of the slightest degree, and perhaps quite unsuspected in its neighbourhood, may, *if local circumstances co-operate*, exert a terribly infective power on considerable masses of population.

5. The dangers which have to be guarded against as favouring the spread of cholera-infection are particularly two. First, and above all there is the danger of water-supplies which are in any (even the slightest) degree tainted by house refuse or other like kind of filth; as where there is outflow, leakage, or filtration, from sewers, house-drains, privies, cesspools, foul ditches or the like, into springs, streams, wells or reservoirs, from which the supply of water is drawn, or into the soil in which the wells are situate; a danger which may exist on a small scale (but perhaps often repeated in the same district) at the pump or dip-well of a private house, or, on a large or even vast scale, in the source of public water-works. And secondly, there is the danger of breathing air which is foul with effluvia from the same sorts of impurity.

6. Information as to the high degree in which those two dangers affect the public health in ordinary times, and as to the special importance which attaches to them at times when any diarrhoeal infection is likely to be introduced, has now for so many years been before the public, that

the improved systems of refuse-removal and water-supply by which those dangers are permanently obviated for large populations, and also the minor structural improvements by which separate households are secured against them, ought long ago to have come into universal use.

So far, however, as this wiser course has not been adopted in any sanitary district, security must, as far as practicable, be sought in measures of a temporary and palliative kind.

(a.) Immediate and searching examination of sources of water supply should be made in all cases where the source is in any degree open to the suspicion of impurity: and the water both from private and public sources should be examined. Where pollution is discovered, everything practicable should be done to prevent the pollution from continuing, or, if this object cannot be obtained, to prevent the water from being drunk. Cisterns should be cleaned, and any connexions of wast-pipes with drains should be severed.

(b.) Simultaneously, there should be immediate thorough removal in every sort of house-refuse and other filth which has accumulated of neglected places; future accumulations of the same sort should be prevented; attention should be given to all defects of house-drains and sinks through which offensive smells are let into houses; thorough washing and lime-washing of uncleanly premises especially of such as are densely occupied, should be practised again and again.

7. It may fairly be believed that, in considerable parts of the country conditions favourable to the spread of cholera are now less abundant than at any former time; and in this connexion, the gratifying fact deserves to be recorded that during recent years enteric fever, the disease which in its methods of extension bears the nearest resemblance to cholera, has continuously and notably declined in England. But it is certain that in many places such conditions are present as would, if cholera were introduced, assist in the spread of that disease. It is to be hoped that in all these cases, the local sanitary authorities will at once do everything that can be done to put their districts into a wholesome state. Measures of cleanliness, taken beforehand, are of far more importance for the protection of a district against cholera than removal or disinfection of filth after the disease has actually made its appearance.

8. It is important for the public very distinctly to remember that pains taken and costs incurred for the purposes to which this Memorandum refers cannot in any event be regarded as wasted. The local conditions which would enable cholera, if imported, to spread its infection in this country, are conditions which day by day, in the absence of cholera, create and spread other diseases: diseases, which, as being never absent from the country, are in the long run, far more destructive than cholera; and the sanitary improvements which would justify a sense of security against any apprehended importation of cholera would, to their extent, though cholera should never re-appear in England, give amply remunerative results in the prevention of those other diseases.

GEORGE BUCHANAN,

Local Government Board.

Medical Officer of the Board.

July 5, 1884.

Extracts reprinted from Inspectors' Reports relating to occurrences of Cholera in England in the years 1865-66.

(1.) *Extract from Mr. Radcliffe's Report on the Outbreak of Cholera at Theydon Bois, Epping (1865).*

Cholera at
Theydon Bois,
Epping, by
Mr. Radcliffe,
1865.

When Mr. McNab had first visited Mrs. Groombridge, he had inquired respecting the state of the water used for domestic purposes. This was obtained by means of a pump from a well beneath the floor of the scullery. Water was fresh drawn for Mr. McNab's inspection. It was clear and bright, and neither in smell nor taste (the latter tested by letting some drops fall from a finger upon the tongue) seemed objectionable. When after Mr. McNab's death Mr. Clegg took charge of the sick, he finding the mischief still increasing among the family without any obvious cause, and having a well-founded doubt of the purity of the water supply of the entire neighbourhood, at once stopped the use of the water from the house-pump. The wisdom of this course will be apparent in the sequel. It probably prevented the entire family being swept off.

When I first visited the house (11 October) the pump had been disused for seven days. On setting the pump again in action, the water poured out proved to be very turbid and abominably fetid. The odour of sulphuretted hydrogen was conspicuous. It was clear that the water was laden with decomposing organic matter. The source of pollution of the well was sought for on the 13th, and on this day I collected specimens of the water, and forwarded them for analysis to Professor Miller of King's College. I append his report. He found traces of sulphuretted hydrogen, and a very large amount of ammonia. There was also a quantity of organic matter in suspension. Free oxygen and nitrates were absent. "There is obviously" he remarks, "some leakage from the cesspool into the well."

The termination of the soil-pipe of the first-floor water-closet and the commencement of a sink-drain each lay within a yard of the mouth of the well. On opening the well indications of percolation through the brickwork nearest the sink, and at a little distance below the level of the mouth, were at once perceived. On pouring water down the sink-drain a steady filtration at the suspected point soon commenced, showing that a communication existed between the sink-drain and the well. On removing the brickwork where the filtration occurred the soil at 2 feet 6 inches from the surface, and in the angle near the pump was found to be saturated with drainage matter. But a careful examination failed to discover any leakage either from the sink-drain or the soil-pipe inside the walls. On prosecuting the search outside, however, it was discovered that the drain in which the soil-pipe terminated and the continuation of the sink-drain (the one drain having no communication with the other) were defective, and that a leakage took place from both. The escaped matters penetrated downwards along the outer wall of the house, passed beneath the foundation, saturated the earth in the angle between the pump and the well, and so reached the latter. Water having been poured down the water-closet, in ten minutes a portion had passed along this track, and was dripping into the well. The soil-pipe from the water-closet was constructed of ordinary glazed stoneware, until it passed beyond the external wall of the house, when it was continued by common 6-inch unglazed butt pipes, without sockets, and simply placed end to end. The leakage took

place at the first joint between the glazed and unglazed pipes, and the porous material of the latter permitted free percolation of liquids.

It would appear to have been thought in the building of the house that the interposition of the thick and solid foundation wall between the drains and the wall would be a sufficient safeguard against contamination of the latter by escaped sewage. The error is one liable to occur; but instances of the pollution of house wells by soakage from without, beneath foundation walls, are, I believe, not common. Hence I have not hesitated to describe the source of pollution in the present case at somewhat greater length than might else have been necessary.

The contamination of the well water was not of recent date. Early in June, Mr. Groombridge had consulted Mr. Forshall of Kingsland Road, N.E. He was then suffering from obstinate indigestion, irregularity of bowels, particularly a desire to go to stool immediately after taking food, inaptitude for active exertion, and great depression of spirits (although his business affairs were prosperous). His health had been more or less disordered for several months. As little relief was obtained from the medicines prescribed, and Mr. Forshall was informed that Mrs. Groombridge and Mrs. Paseell were suffering in a less degree from similar symptoms, he suspected that the water used by the family might be impure. In answer to his questions Mr. Groombridge stated that it was very hard, and gave to tea a disagreeable flavour. Mr. Forshall requested that a specimen should be brought to him. This he received on the 17th June. The water was limpid, but it had an unpleasant odour and nauseous taste, and it was submitted to Mr. Goff of the Kingsland Road, an operative chemist, for analysis. Mr. Goff reported that the specimen contained traces of sulphuretted hydrogen, and much organic matter. Notwithstanding this discovery, the faith of the family in the goodness of the water was not shaken, and they persisted in its use until the outbreak of cholera.

Mr. Forshall prescribed both for Mrs. Groombridge and her mother; and it was upon his recommendation that Mr. and Mrs. Groombridge visited Weymouth.

From Mr. Forshall's statement, it is apparent that Mr. Groombridge's family had been drinking water contaminated by drainage from early in June, probably for a longer period. The outbreak which is the immediate subject of inquiry may be surmised to have followed upon the further pollution of the water by the alvine evacuations of Mr. and Mrs. Groombridge during the two or three days immediately following their return from Weymouth. At this time the water-closet on the floor of the house was in frequent and unaccustomed use; large quantities of liquid fæces were received in it, and all the ejections both from the stomach and the bowels, during the first brunt of Mrs. Groombridge's illness, were cast down it. The largely increased quantity of water passing from the water-closet along the soil-pipe and terminal drain would contribute to a more rapid contamination of the well.

(2.) *Extract from Dr. Buchanan's Report on Results of Works, &c. for promoting Public Health (1866).*

Cholera epidemics appear to have been rendered practically harmless in the towns examined. The following statement is eloquent of the effect of sanitary measures upon this disease. Unless where otherwise noted, the epidemic of 1849 found the town entirely unprepared, the attack of 1854 came while its works of drainage or water supply were in progress, and that of 1866 has found it in conditions of comparative cleanliness and purity. The towns are placed in the order in which they suffered in 1849, Cholera.

Cholera: effect
of sanitary
measures.

with the deaths from cholera per 10,000 of the population existing at each date, less than three cases not being reckoned:—

Town.	1848-9.	1854.	1866.
Merthyr* - - - - -	237	84	20
Cardiff - - - - -	208	66	15½
Alnwick - - - - -	205	—	—
Salisbury - - - - -	180	14½	—
Newport - - - - -	112	1½	12
Brynmawr - - - - -	100	—	—
Bristol - - - - -	82	11	1½
Dover - - - - -	40	10	4½
Croydon - - - - -	27	21	2
Carlisle - - - - -	22	6	—
Morpeth - - - - -	14	11½	—
Warwick† - - - - -	10½	—	—
Macclesfield - - - - -	9	1	—
Peurith - - - - -	9½	—	—
Chelmsford - - - - -	4	2½	—
Banbury - - - - -	2	10	—
Leicester - - - - -	1	—	—
Cheltenham§ - - - - -	—	1½	—
Penzance - - - - -	—	—	—
Ely - - - - -	—	28	—
Rugby - - - - -	—	—	—
Stratford - - - - -	—	—	—
Worthing - - - - -	—	—	—
Ashby - - - - -	—	—	—
Ottery - - - - -	—	—	—

* 1854 before any public works, but some improvement in cleansing. 1866 town still undrained, but good water and other progress.

† 1854 before any public works, but some improvement in cleansing.

‡ 1854 before drainage and works done.

§ 1854 before the new public works done.

|| 1854 before houses connected with new public works and sewer system.

(3.) *Extracts from Reports (1866) on various outbreaks of Cholera, with particular reference to the Sanitary Circumstances under which they occurred.*

a. *By Dr. Buchanan (May 19), on Imported Cholera among Emigrating Foreigners in the Mersey.*

Outbreak of
cholera among
foreigners in
the Mersey,
1866.

I HAVE the honour to report to you the following as to the condition of the emigrants who have been removed from the "Helvetia," and as to the measures which I have taken in pursuance of instructions given me on the 16th instant.

I found that up to the 15th instant 32 of the emigrants had died of cholera, viz., four in the workhouse (exclusive of three recently arrived foreigners who had died there without having been in the "Helvetia") 20 in the "Jessie Munn," and eight in the depôt at Birkenhead. The remainder of the 925 emigrants had been thus disposed of—250 or thereabouts were in the Birkenhead depôt, and of these 11 were ill of cholera; 20 remained on board the "Jessie Munn," most of them being convalescent from cholera, but some being persons under suspicion only of the disease; 25 remained in the "Warecloud," having also been under suspicion; about 40 were in the Liverpool workhouse, of whom 11 were suffering under cholera or were convalescent from the disease, and the remainder were under observation; and the balance of the 925, viz., about 558 persons, should

have been in warehouses at Bankhall, Bootle, all of them healthy ; some of the last-mentioned people, however, were known to have gone away from the warehouses into Liverpool, where they could not be traced.

Cholera in the
Mersey.

The people at Birkenhead were all foreigners, mostly families, and the sickness among them had been in people of various nationalities, but with a preponderance of those who came through Rotterdam. The people at Bankhall comprised 227 foreigners, most of them single men, and the remainder were British subjects. Those who had escaped into Liverpool were chiefly Irish. A few persons of various nations had fallen ill of cholera among the people at these warehouses, and had been removed case by case, as soon as they occurred, to the Liverpool workhouse. In the course of Wednesday, the 16th, the 25 persons who had been under observation in the "Warclond" were transferred to Bankhall.

In the Birkenhead depôt the people were provided with all necessaries except proper changes of linen, and these were being distributed from charitable funds collected by two German clergymen of the neighbourhood. Sufficient supervision to preserve order existed, but there was an uncertainty and conflicting authority in dealing with the people. Thus on my arrival at the depôt at noon on Thursday, the 17th, I found no dinner provided, and an arrangement pending—it was difficult to fix on any person the responsibility of having made it—to transfer all the people from the depôt to the Bankhall warehouses. Again, there was no sufficient isolation of the sick people, nor of the persons whose relation to the sick brought them under suspicion. All were under the same roof, the cholera cases in a "hospital" only partially separated from the sleeping places of the healthy.

In the Bankhall warehouses provision had been extemporised by the select vestry of Liverpool for the accommodation of the people placed there, and they had been supplied with changes of linen and other necessaries. The deficiencies of the place consisted in a want of lavatories and in the circumstance that the classification of the people did not meet their own views, though it appeared sufficient for the purposes of decency and safety. Another condition of this lodgment at Bankhall was, that the people were allowed to wander into Liverpool and Bootle at their will, and some of them did not return. On the evening of the 18th only 484 persons slept here, leaving about 70 unaccounted for. These warehouses, though fairly answering their purpose with their present numbers, could not have been properly allowed to hold the additional number which it was proposed to transfer to them from Birkenhead. At Bankhall an ambulance was kept, ready horsed, by the guardians of Liverpool parish, and a medical man and interpreter were on the watch for cases of early illness, which were easily transferred to the workhouse.

At the Liverpool workhouse cholera cases were being treated in two floors of the fever hospital, which were so managed as to be satisfactorily isolated, and the people under observation were in a wholly isolated shed.

In all places adequate medical attendance and competent nursing appeared to be afforded. Particularly I must take leave to report that, under most trying circumstances in the "Jessie Munn," the nursing has been done with exemplary devotedness and efficiency.

The dates of the deaths from cholera (including ALL that have occurred on the river or on either shore) have been as follows:—

May 2	-	-	2	May 10	-	7	} with 6 added in the four days.
3	-	-	1	11	-	3	
4	-	-	0	12	-	3	
5	-	-	0	13	-	2	
6	-	-	1	14	-	1	}
7	-	-	1	15	-	2	
8	-	-	2	16	-	1	
9	-	-	4	17	-	1	

Cholera in the
Mersey.

Only one fresh case of cholera was known to have occurred among any of the emigrants or their attendants during the whole of yesterday or the day before (May 17, 18), and that was in a foreigner taken on the 17th from Bankhall to the workhouse with a slight attack. Moreover, the severity of recent attacks has been less than at the beginning of the outbreak, and in the persons attacked recoveries are now more frequent than deaths.

No single authenticated case of cholera is known to have occurred in Liverpool or Birkenhead, except among persons who had had to do with the "Helvetia" and among other foreign emigrants waiting for the means of transit. One or two of such that were fatal are comprised in the foregoing list.

Beyond advising such additions to the Bankhall accommodation as appeared requisite, I did not interfere in any way with the arrangements on the Liverpool side of the Mersey; probably no stricter isolation of the people would have been practicable, and at any rate, if harm should come of their scattering, the chief of that harm must be already done; while, on balancing the existing conditions against those that might conceivably be enforced in the way of restriction, I could not certainly have said that the advantages would be positively on the side of more seclusion.

The conditions at Birkenhead appeared susceptible, however, of much improvement. The want of responsible authority was clear, and the desirability of separating the sick and healthy was agreed on at all hands. The Disease Prevention Act having been put in force, the Board of Guardians became empowered to take action of precisely the kind that was desirable. Accordingly, after seeing that the immediate wants of the emigrants in the dépôt were met, and after countermanding the conveyance of them to Bankhall, I set to work to determine how in practice the required ends could best be attained, and having satisfied myself on all necessary points, I saw the vice-chairman of the Board of Guardians, who undertook (as I stated to you in my telegram) to act immediately upon my advice. At a meeting of the Board yesterday (18th May), resolutions were passed confirmatory of this action, and by the present time the healthy people, taken charge of by the Guardians under the Diseases Prevention Act, have been removed to the new building at Tranmore, where they will have advantages greater than could ever have been thought of in such an emergency, and from whence any who fall sick will be returned to the dépôt. The Guardians have also undertaken the management of the sick who remain in the dépôt continuing as far as possible the services of the present staff of officers. I append copies of my letters to the Birkenhead Board of Guardians and of their resolutions thereon.

b. By Professor Parkes, on Cholera in Southampton.

Outbreak of
cholera in
Southampton,
1866.

I reported last year* to the medical officer to the Privy Council the particulars of the outbreak of cholera in Southampton in the autumn of 1865. I have now to report more briefly on the outbreak which occurred in the same town in July and August 1866, and which is, I believe, in many respects, a very instructive one.

The last case of cholera in 1865 occurred on the 4th November, and from that date till June 1866 there was not a single case, either registered in the death returns or reported by any medical practitioner. The deaths from diarrhoea were also very few; in January 1866, there was no death; in February, March, and April, only one in each month; in May only two; and in June three, of which one was certainly cholera. In July, August, and September, there was an increase of deaths from diarrhoea, chiefly owing to the registration of deaths from cholera under the heading

* Not reprinted in these papers.

of diarrhœa. It is doubtful whether apart from cholera there was any increase of fatal diarrhœa properly so called, during the period of the cholera outburst. Cholera in
Southampton.

The following are the number of deaths registered in Southampton from cholera and diarrhœa, as extracted from the report of the sanitary committee of the Board of Health from the 1st of June to the 31st October:— Number of
deaths.

						Registered Deaths.	
						Cholera.	Diarrhœa.
Week ending June	4	-	-	-	-	—	—
"	"	11	-	-	-	—	—
"	"	18	-	-	-	1	1
"	"	25	-	-	-	—	2
"	July	2	-	-	-	—	3
"	"	9	-	-	-	1	2
"	"	16	-	-	-	16	7
"	"	23	-	-	-	27	2
"	"	30	-	-	-	21	2
"	August	6	-	-	-	15	4
"	"	13	-	-	-	14	3
"	"	20	-	-	-	6	1
"	"	27	-	-	-	1	3
"	Sept.	3	-	-	-	1	6
"	"	10	-	-	-	1	6
"	"	17	-	-	-	4	1
"	"	24	-	-	-	1	3
"	Oct.	1	-	-	-	—	—
"	"	8	-	-	-	1	2
"	"	15	-	-	-	1	—
"	"	22	-	-	-	—	—
"	"	29	-	-	-	—	—
Up to and including 31		-	-	-	-	—	—
						101	48

It is impossible to be quite sure how many of the deaths registered as diarrhœa were really from cholera; I believe a large proportion of them, but it is now hopeless to attempt a precise statement.

The total number of cases of cholera is stated by the local board of health to have been 320, but I feel uncertain whether this is correct. Number of cases.

The determination of the exact number is, however, a matter of little consequence; it is of much more importance to find out what caused the re-appearance of the disease. Mode of origin.

In the spring of 1866, some apprehension of cholera was caused by the constant arrival of steamers carrying German emigrants from infected ports. On reaching Southampton the emigrants were always allowed to land, and often remained the whole night in the town; and it was feared that in this way cholera might very readily be introduced. But the state of the law at the time rendered it impossible to prevent the landing of those people, although their doing so brought great risk to the town without any adequate benefit.

Happily, however, these fears proved unfounded; at least there is no evidence that any emigrant vessel introduced the disease, and it so happened that no emigrant vessel leaving Southampton for America suffered from cholera on the voyage.

On the 10th of June 1866, the Peninsular and Oriental Steam Ship "Poonah," arrived from Alexandria, Malta, and Gibraltar having on the preceding day lost a man from cholera. The incidents connected with this voyage and the probability that the disease was thus introduced into Southampton are so important, that I shall narrate them with great care. Case of the
"Poonah."

I derived my information from the official papers, and from information given me by Dr. Chapman, the surgeon of the vessel, and by a fireman on board, who gave me very careful and circumstantial evidence.

On the voyage home from Alexandria both crew and passengers enjoyed perfect health until two days before arriving at Southampton, when a man died from cholera, and several others became ill with severe diarrhoea. The cause of this outbreak was attributed to the use of foul water. Water was taken in at Gibraltar, and the tank containing it was opened on Tuesday, June 5th. According to the statement of the medical superintendent of the Peninsular and Oriental service, this water might be used by passengers and crew: Dr. Chapman told me it might be used by the firemen and crew, about 60 persons in all, but not by the passengers; the fireman told me that he thought only the firemen used it, but this was not certain. It is, however, quite clear that the firemen used more of it than the other men, as on account of their occupation they always drink much more. The choleraic or diarrhoeal affection occurred with one exception, entirely among the firemen.

The water smelt and tasted very foul from the moment it was used.

On Friday, the 8th June, a fireman named Joseph Bachelor went on deck and drank a very large quantity of this water; early the next morning he was taken ill with violent purging, vomiting, and cramps, followed by coldness and pulselessness, and died in nine hours. He was buried at sea on Saturday.

On the same day (Saturday, June 9th) six or seven other firemen, and on the following day three or four more were affected with violent purging, and some with vomiting as well; none of these men reported themselves to Dr. Chapman as they were afraid of being detained on board. My informant was taken ill on Saturday; he had great purging of watery fluid, with cramps in the stomach but not in the limbs; he had no vomiting; his eyes were sunken with dark areolæ; and he passed no urine for three days. The diarrhoea (15 to 20 stools per diem) lasted for four days. In this man's watch there were six other men all affected in the same way, and several others were ill. All the men who were ill had drunk the water, but it was not certain that all who drank the water became ill. No passengers were attacked, and only one man of the crew.

All these sick men landed in Southampton on Sunday and Monday (June 10th and 11th), and dispersed over the town; they were seen by several medical men who diagnosed the disease as the severest "choleraic diarrhoea." Only one of them died, and most of them in spite of the diarrhoea continued at work. All of them, even before landing, attributed their disease to the foul water.

I think it may be concluded without hesitation that this severe diarrhoea outbreak was owing to the water. The freedom from any affection of the kind during the voyage, the ascertained foulness of the water, the fact that those who drank most of it (the firemen) were chiefly affected, the number attacked, and the suddenness of the outbreak, give sufficient evidence. Cholera did not exist at the time at Malta or Gibraltar, and I believe not at Alexandria.

So far, however, in spite of the death on board with every symptom of cholera, it might be contended that this diarrhoea was not true cholera, but a case of the highest interest sets the question at rest. I derive the following account from the widow of one of the firemen of the "Poonah."

Edward Palmer, a fireman in the same watch as Bachelor, the man who died, went to his home, 106, Bevoir Street, a very clean airy situation on Sunday, June 10th. Either on that day or on Monday he was attacked with diarrhoea, which was very bad on Monday, Tuesday, and Wednesday. He slept in an airy room with his wife and child; he generally used the closet outside, but once or twice used the utensil in the room, which, however, the widow informed me he emptied immediately. On Wednesday, June 13th, his child (a boy aged about three years, and previously in perfect health) was suddenly taken ill at 10 a.m. with violent vomiting, purging, and cramps; he soon became very cold and died at 4 p.m. The child was seen by several medical men, who were satisfied the case was one of cholera. On the Thursday Palmer himself

became worse; he was very sick; had cramps; the eyes were sunken; the hands shrivelled; he passed no urine; and died on Friday, June 15th.

Cholera in
Southampton.

No other case occurred in the house or neighbourhood, and, as I ascertained by a careful inspection, there was no possible local cause to account for the child's death.

This incident proves that the disease caused by the foul water was really cholera, and that it was communicated. Moreover, the disease was given by the father to the child while it was yet in the so-called diarrhoeal stage, and before the distinctive symptoms of cholera had come on.

There were only five people in this house, viz., Palmer, his wife and child, and two other persons who lived on the ground floor. No subsequent case occurred either at this time or afterwards in this house or neighbourhood. The house is drained into the town sewer, and is supplied with water from the town reservoir on the continuous system.

Although there was no other death there can, I conceive, be no doubt that all the men who landed from the "Poonah" with so-called diarrhoea suffered from the same disease as Batehelor died of on board, and Palmer and his child on shore, and that this disease was cholera. This being admitted, there can also be no question that the dejecta of cholera in large quantities must have passed from 8 to 10 persons into the sewers of the town.

Was the cholera thus introduced into Southampton?

Before considering this point, I may perhaps be permitted to say a few words on the origin and composition of the tank water which caused the disease in the firemen. Water from the
"Poonah."

A few days after the "Poonah" came in, some of this tank water was sent to me. Its composition was on the 18th June 1866:

	Grains per gallon.
Mineral solids - - - -	- 35·49
Volatile solids (by incineration) -	- 5·74
Total solids - - - -	- 41·16
Total hardness (Clark's scale) -	- 150·75
Permanent hardness - - - -	- 90·8
Removeable „ - - - -	- 50·95

One litre contained oxidisable matter enough to destroy 19 milligrammes of permanganate of potassium. The amount of nitrites, nitrates, and phosphates was very large. There was no sulphuretted hydrogen at this time, although this subsequently formed. There was a good deal of chloride of sodium, sulphates and carbonates of lime and magnesia. There could be no doubt of its contamination with sewage.

Subsequently some of this same tank water was sent to Professor Taylor, of Guy's Hospital, who found it to have the following composition:—

Dr. Taylor's analysis, dated August 7th, 1866.

	Grains per gallon.
Mineral substances - - - -	- 37·6
Organic and volatile matter - -	- 5·4
Total - - - -	- 43·0
Hardness (Clark's scale) - - -	- 150

The separate ingredients are not mentioned, but the water is said to contain carbonate of lime and magnesia, chloride of sodium, sulphate of lime, and soluble alkalies. It also contained sulphuretted hydrogen; when distilled the residue had lost the smell of sulphuretted hydrogen, but retained an offensive odour resembling decomposed sewage matter.

Cholera in
Southampton.
—
Water from
Gibraltar.

This water was known to have been shipped at Gibraltar, and was supposed to have come from one of the North Front Jetty wells,* from which the merchant vessels are generally supplied. The Peninsular and Oriental Company sent out to Gibraltar and obtained, on July 19th, some of this water, which they sent to Professor Miller, of King's College, to analyse. The following was his report:—

	Grains per gallons.				
Mineral solids	-	-	-	-	43·48
Volatile	-	-	-	-	1·12
					<hr/> 44·60
Total hardness (Clark's scale)	-	-	-	-	27°·3
Permanent hardness	-	-	-	-	10°·5
The separate ingredients were:—					
Carbonate of lime	-	-	-	-	7·67
Carbonate of magnesia	-	-	-	-	7·78
Nitrate of magnesia	-	-	-	-	5·42
Sulphate of soda	-	-	-	-	10·52
Chloride of sodium and a little chloride of potassium	-	-	-	-	12·09
Organic matter	-	-	-	-	1·12
					<hr/> 44·60

Some water taken from the three North Front Jetty wells by order of the War Office was also sent direct from Gibraltar to Mr. Abel, and the following is his analysis, dated October 13th, 1866:—

	No. 1 Well.	No. 2 Well.	No. 3 Well.
	Grains per gallon.	Grains per gallon.	Grains per gallon.
Carbonate of lime - - -	11·14	9·64	10·94
Sulphate of lime - - -	4·08	8·16	9·20
Nitrate of lime - - -	1·75	1·75	2·00
Carbonate of magnesia - - -	6·30	5·77	7·87
Chloride of sodium - - -	10·63	13·10	14·16
Organic matter - - -	1·50	2·00	2·10
Total solids - - -	35·40	40·42	46·27
Hardness (Clark's scale) - - -	23°	26°	30°

While there is a good deal of agreement in the analyses by Professor Taylor and by me, which were undoubtedly of the same water taken (at different times) from the tank, there is a great discrepancy in the other analyses of water taken from the wells at Gibraltar at different times.

Up to the time of seeing Dr. Miller's analysis, I had felt no doubt of the origin of the "Poonah" tank water from the North Front Jetty well, but on learning Dr. Miller's result, it seemed to me hardly possible to account for such a discrepancy between the analyses of Dr. Taylor's and mine on the one hand, and Dr. Miller's on the other, by any change in the water of the well, between the periods when it was drawn for the "Poonah," and for Dr. Miller's analysis.

The doubt raised in my mind was strengthened by another circumstance.

I had written to Dr. Rutherford, Deputy Inspector General of Hospitals, stationed at Gibraltar, to inquire how the North Front Jetty well could have become contaminated with diarrhoeal or choleraic discharges, for that the common water of the well, bad as it is, could produce such a disease as that of the firemen, seemed in the highest degree improbable.

* There are three wells known by the name of the North Front Jetty wells; all of them are somewhat under the influence of the tide, especially the one nearest the sea.

Dr. Rutherford after giving full information of the position of the jetty walls, and of the strata furnishing the water, thus answered my other questions:—

"1. I really do not see how the well in question could have been contaminated with common sewage matter in May or June 1866, seeing there are no sewers in its neighbourhood, unless, indeed, such impurity was derived from the gardens at some considerable distance, or from the sea, either contingency improbable.

"2. I consider it impossible that diarrhoeal or choleraic discharges could have found entrance into the well at the time specified, as since the cessation of cholera in October 1865, neither diarrhoea or cholera existed in or about the garrison. Indeed in May or June 1866, and for months before and after, everybody near these wells enjoyed perfect health, as far as bowel complaints are concerned at all events."

These facts coupled with the discrepancy of the chemical analyses made me anxious to have some further proof that the "Poonah" water really came from one of the North Front Jetty wells.

I requested several persons to give me information, and eventually Dr. Chapman, of the "Poonah," was able to learn the following for me. Merchant vessels are generally supplied from the North Front Jetty wells, but on the occasion in question the "Poonah" was decidedly not watered from these wells. Dr. Chapman could not learn precisely whence the water was drawn, but found that the most probable source was from a well situated near to the Jews burying ground.

Dr. Rutherford has informed me that this well is 250 yards from the burying ground, and that in his opinion soakage into it from the graves is impossible. I have been able to get no further information.

I fear, indeed, that the source of the tank water of the "Poonah," and the nature of its contamination, will now never be discovered. It may be a question whether the water was taken from Gibraltar at all.

However, the facts remain, viz., that whatever its source, the water was very foul, and no doubt from sewage; that at least eight, and probably 10 or 12 men who drank it, were violently ill with cholera or severe choleraic diarrhoea; that one of these men died on board after nine hours' illness, and another on shore after several days' illness, and after giving cholera to his child; and that several other men (7 or 10) suffered for several days in Southampton after landing with very severe choleraic diarrhoea.

The question now is, did these men introduce cholera into Southampton?

Introduction
into South-
ampton.

Four cases, in addition to the "Poonah" cases, were reported as occurring on the following dates in inhabitants of Southampton: one case on June 12th; one on June 15th; two on July 6th.

Of these, I am quite satisfied that the supposed case on June 12th and one of the cases on July 6th were not cases of cholera at all. I have also great doubts about the other two (15th June and 6th July), but the gentleman who attended them, and for whose opinion I have an unfeigned respect, is satisfied that they were genuine cases. If so, no direct communication can be traced between them and the "Poonah" cases, but it is impossible to prove the negative.

Whatever may be the truth as regards these two cases, in the early part of July, three weeks or a month after the arrival of the "Poonah," the outbreak decidedly commenced. On the 6th there was one case; on the 11th there was one case; on the following day another; and on the 13th no less than nine; there were about the same number on the 14th, and 10 on the 15th and 16th, but the numbers are not precisely known, and there may have been more before the 13th than I have stated. Up to the evening of July 17th probably no less than 35 to 37 deaths had occurred. On the following days the numbers were not quite so great, and on the 24th July the cases were greatly diminishing in some of the worst districts. By the 4th or 5th August the outbreak was virtually over, though a few cases occurred through the rest of August. Even in September seven deaths were registered from cholera, and two in October.

Cholera in
Southampton.

The return copied at a previous page from the sanitary committee's report does not properly show the extreme rapidity of the spread in the first instance and the rapid decline, as the dates are taken from the dates of registration of the deaths and not from the dates of attack.

What then was the cause of this sudden outburst?

As far as locality went it was confined to the low and unhealthy parts of the town, but was scattered through them and was not extremely bad in any one spot. All the upper part of the town was free, and the surrounding suburbs and villages remained unaffected. The following are the conclusions I have arrived at after carefully collecting and considering the evidence:—

I. Except the "Poonah," there is no traceable mode in which the disease could have been imported, though of course as cholera existed in so many parts of the continent with which Southampton is connected and in England, it is impossible to absolutely disprove another channel of importation.

II. If introduced by the "Poonah" it did not immediately spread from these cases as centres; one case (the child) can indeed be traced back, but the others had no obvious connexion; that is to say, the connecting link was not that of proximity.

III. Although manifestly caused in the "Poonah" by bad water, its subsequent outburst in Southampton was entirely unconnected with the drinking water.

Water of
Southampton.

The whole of Southampton is supplied from a town reservoir; the supply is continuous; there are no cisterns. If the water was the cause, it must have affected the town generally; there are nearly 50,000 people in Southampton, and there were only about 320 cases of cholera scattered over nearly three months. It is impossible to suppose that 49,700 people who used the water could have escaped had the water been bad. At the end of July (when it is true the outbreak was subsiding), the water taken from districts where cholera was prevailing was analysed, the volatile solids were 1.4 grains per gallon; the mineral 15. There was no nitric, nitrous, or phosphoric acid, or any evidence of sewage; in fact, the water was of its ordinary composition. I believe we can entirely exclude the drinking water as a cause of the outburst.

IV. The disease was certainly worst in the most unhygienic parts of the town, but was not confined to these, for good houses in airy situations in the low part of the town suffered, and some of the worst localities remained free. I can only repeat what I have already stated in my former report, that unhygienic conditions of an ordinary kind can only be reckoned as localizing or intensifying causes, not as capable of originating the disease. If, indeed, cholera could have arisen from ordinary unhygienic conditions, it might have been expected in May or the beginning of June, for at that time the sewers in the low part of the town were being cleared out; the sewage matter was heaped on the banks, and was very foetid, yet no cholera was caused, and the sewers had been closed, and the sewage matter removed before the cholera occurred.

V. I have referred in my former report to the very unsatisfactory nature of the explanation which is attempted to be given of such outbreaks, by referring them to peculiar atmospheric or unknown epidemic conditions. There was no evidence of such epidemic influence in any increased illness, diarrhoeal or otherwise, before the outburst, and there was nothing unusual in the common meteorological conditions.

Causes of spread.

VI. I believe, however, that the outburst is capable of a satisfactory explanation, provided only the proviso be granted that the intestinal discharges of cholera are capable of propagating the disease at once, or at a certain period of decomposition. To make my explanation clear, however, I must enter into a little description of the sewerage of Southampton.

Almost all the town is sewered, but unfortunately on a bad principle, a very large network of sewers being provided towards the outlet, in order to act as a reservoir during certain periods of the tide. There is thus a great stagnancy during several hours in the day, and indeed at some periods it is probable that there is very little flow even for long periods. The ventilation is very imperfect, being provided for by gratings in the

road, and as these give off offensive effluvia, they are continually stopped up with pieces of wood by the inhabitants of the neighbouring houses. The consequence is, that the gases are thrown back upon the houses, and force their way through the very imperfect traps.

The drainage from the western part of the town is raised by pumping, and is then discharged into the eastern sewers and passes to the outlet, after more or less detention in the eastern sewers.

Now, just before the outbreak of cholera there was this condition of things. Owing to the cleansing of the sewers the pumping at the regular station had been discontinued for some time; there had been more accumulation than usual in some of the sewers, partly from this cause, partly from a scarcity of water. The water mains were being altered to give a larger supply, and fresh machinery was being erected. During this time, in spite of the greatest exertions on the part of the water engineer, the supply, especially to the lower parts of the town, was insufficient; one of the difficulties of the continuous system was now felt. In the upper parts of the town, where the water was first received, an immense quantity was used, and (as the weather was dry) especially for watering gardens. The lower parts of the town suffered therefrom in a twofold way, from the actual lessened supply, and from the greater use on the part of their richer neighbours. As the rainfall was unfortunately small, there can be no doubt that the flow through the sewers was much slower even than usual, in fact, it may be questioned whether there was not almost complete stagnancy at the end of June and the beginning of July.

While this state of things was going on, on the 10th or 11th June the men landed from the "Poonah," and some of them continued to suffer from choleraic diarrhoea for six or eight days, or nearly till the 20th June. All the copious discharges from eight or ten persons passed then into these sewers, western and eastern, which were almost clogged. Admitting that these decomposing discharges would produce the disease, this state of things was very ominous for Southampton, as it was clear that the insufficient ventilation would force the vapours or gases into every house with a bad trap. Independently of anything else, I believe that cholera would have broken out; but another circumstance occurred which seems to me to have been the immediate cause of the outbreak.

In the beginning of July the pumping of the western shore sewer into the outlet sewer was re-commenced. The pumping station is near the floating bridge in a tolerably good neighbourhood, but all round it are some of the low-lying parts of Southampton. The pumping is done by a steam engine and generally goes on day and night.

All the immense mass of sewage from the western sewers was raised and was then poured down an open conduit into the outlet sewer. Tons and tons of sewage were thus daily pumped up, and frothing and agitated by this churning were poured like a cataract down the open channel for some 8 or 9 feet. The effluvia disengaged from this quantity of seething sewage was overpowering. It spread all over the neighbourhood and was bitterly complained of in the adjacent houses. The effect, however, would not be confined to them; the cloud of effluvia thus thrown up must have extended far beyond the point where it was detectible by smell.

The occurrence of some early cases of cholera in clean airy houses near this pumping station was the first thing that called attention to it, and it was then found that diarrhoea was beginning to prevail in several of the adjacent houses. There was no local cause to account for these attacks except the great effluvia thus disengaged. Some cause having to be found for these choleraic and diarrhoeal cases, and nothing being discoverable in the houses or in the water supply, it seems quite justifiable to attribute them to the organic substances sent out in enormous quantities into the atmosphere by this system of pumping; and if so, some of the more distant cases may be reasonably ascribed to the same cause.

As soon as this was discovered means were taken to substitute a closed iron pipe for the open conduit, and carbolic acid was largely and constantly introduced at this point into the sewers. The alteration was not completed till late at night on the 18th July; on the 19th there was not the slightest disengagement of effluvia. As already said the number of

Subsidence of
the outbreak.

Cholera in
Southampton.

cases of cholera were very numerous from the 13th up to the 17th or 18th of July; they then lessened, and on the 24th July it was evident that the worst was over.

To what cause could this rapid diminution be ascribed?

No doubt a great deal was being done in all sanitary ways, but the strongest impression was made on my mind that the principal cause of the outbreak had been the discharge from the pumping station into the air of fecal effluvia from sewers into which cholera discharges had been largely introduced and retained, and that the rapid decline was owing to the removal of this cause of foulness of the air.

I do not, however, wish to state that all the cases were owing to this. In some instances the houses were too far away from the pumping station, or the cases occurred too long after the defect was remedied, to be explained by the supposition of a long incubative period. In some of these cases the house traps were inefficient, and sewage gases found their way in, and this perhaps kept up the few scattered cases which continued in August and September.

On the whole this outbreak has certainly strengthened my conviction that the decomposing choleraic discharges will produce the disease, and that they will spread through the air as well as through the medium of water. In fact, in this outbreak we have instances, I believe, both of transmission by water and by air.

I believe then I have accounted for this sudden outbreak in as satisfactory a manner as can be done in these inquiries, and the more the points are considered, the coincidences as to time, of prevalence and decline with the peculiar conditions of the sewer arrangements, the impossibility of accounting for the attacks in other ways, the more will conviction be brought to the mind that the above explanation has every look of probability. Neither in this attack in Southampton, or in the former one, have I found any evidence in support of Pettenkofer's opinion that the discharges must pass into the ground and there decompose. They can decompose equally well in sewers. The conditions of soil and subsoil water mentioned by Pettenkofer are no doubt of importance in many cases, but they are obviously not essential.

Preventive
measures.

It now only remains to state the preventive measures. They were instituted and carried on with great vigour by the sanitary committee, of which Mr. Stebbing was the indefatigable chairman, and by Dr. MacCormack, the officer of health. Dr. Wilkin, the superintendent of quarantine, gave as in the former outbreak the most valuable assistance, and so did all the parochial officers and other medical gentlemen. The greatest efforts were made to disinfect the discharges, and linen in the houses, and to disinfect the sewers. Carbolic acid was freely supplied to all houses, and was used also for watering the streets and pouring into the sewers. A suggestion of Professor Maclean's that all the inhabitants of the higher parts of the town should be requested to pour carbolic acid down their closets was also attempted to be carried out, so as to get the whole length of sewer impregnated with the acid. Infected clothing was burnt or otherwise purified, and limewashing, scavenging, house to house visitation, &c., were carried on with great energy. The average daily amount of carbolic acid used was about 20 gallons; on one day, however, about 34 gallons were used. About 30 lbs. of chloride of lime were also daily used chiefly for utensils, linen, and sinks in houses.

c. By Dr. Buchanan on Cholera in Irish Mail Steamers and at Holyhead.

Concerning Cholera on the Mail Packets.—The following is a list of the cases of Cholera and Choleraic Diarrhœa that have occurred on board the mail packets of the City of Dublin Company.

Cholera on Irish
mail steamers.

Name and Occupation.	Date of Attack.	Which Mail-boat,	Where landed.	Disease.	Result.	Date of Death.
1. John Hughes, seaman.	Sept. 29	Munster -	Kingstown	Cholera* -	Death -	Sept. 30.
2. John Thomas, fireman.	Oct. 7 -	Munster -	Holyhead -	Cholera† -	Death -	Oct. 8.
3. — Lewis, stoker -	Oct. 8 -	Munster‡ -	Holyhead -	Cholera -	Death -	Oct. 13.
4. Robert Roberts, whitewasher.§	Oct. 12 -	Munster -	Holyhead -	Choleraic diarrhœa.	Recovery	—
5. Lewis Jones's son, under-steward.	Oct. 7 -	Ulster -	Holyhead -	Severe diarrhœa.	Conva-lescing,	—
6. Thomas Hughes, stoker.	Oct. 7 -	Ulster -	Holyhead -	Cholera -	Recovery	—
7. Thomas Williams, steward.	Oct. 7 -	Connaught	Kingstown	Cholera -	Death -	Oct. 7.
8. Hugh Griffith, boatswain.¶	Oct. 8 -	Connaught	Holyhead -	Cholera -	Recovery	—

* Subject of inquiry by Irish Poor Law Commissioners.

† Captain doubts whether disease was not "brain fever;" Doctor says "cholera."

‡ Temporarily employed from Oct. 3 to Oct. 6, when left ship.

§ Employed in disinfecting ship.

|| Had belonged to Munster till the journey on which he fell ill.

¶ Had attended on Williams at Hospital.

The chief stress of the disease has fallen on the "Munster," and all the fatal cases, four in number, have been in persons connected with that vessel.

As to the cause of Cholera on the mail vessels, the following data only exist: 1. There was no Cholera at Holyhead, and very little at Kingstown at the time when the first attack occurred on the "Munster." 2. The sanitary condition of all the packets was fully up to the usual condition of first class steamers. 3. The water supplied to all the steamers was from Juggy's well at Kingstown. This well is situated in a recess formed by three walls, ill lighted at night. It is approached by steps, over which the water rises to a varying height, being a foot or two higher in the morning than in the evening after the day's use. 4. A case of Cholera, one of the earliest in Kingstown, occurred on September 27 (two days before the first attack on the "Munster"), in a house situate about a quarter of a mile off Juggy's well and situate on rising ground above it.*

Precautionary measures have been employed to all three of the mail packets. The "Munster" was laid up in the course of the week Oct. 7-13th; every compartment was disinfected with chlorine and white-

Causation.

Precautions.

* Evidence of specific contamination of the well by cholera could not be obtained. Specimens of the water collected on Oct. 14th have been sent to Professor Miller for analysis. It will probably turn out that the water has the ordinary characters of that from surface wells; and additional impurities may have been directly introduced owing to its exposed situation and unprotected state. The suggestion, however, that the well receives sewage from the infirmary, the garden wall of which forms one of the walls of the well recess, is of no special moment. The infirmary could only affect the well by percolation for some distance of refuse fluids through the subsoil, in the same way as other houses equally near and standing on a higher level might affect it. At the time of the first attack on the "Munster," water from Juggy's well was taken each day to the ship, but up to that time there had been no cholera in the infirmary.

Water.

Professor Miller reported, October 26, "The water was clear and bright and free from offensive smell or taste. It is a hard water, and though it softens considerably on boiling, yet after boiling it still remains hard. The quantity of recent organic matter is but small; the amount of ammonia also is inconsiderable; but the quantity of nitrates, though not excessive, show drainage from a soil impregnated with decaying organic matter of animal origin."

Cholera on Irish
mail steamers.

washed; the wood-work of the fore-castle and of other parts was washed with disinfectants, and wherever it could not otherwise be satisfactorily dealt with, it was pulled down and replaced by new. The bilges were pumped out, with free use of disinfectants. The water tanks were emptied and fresh water procured from the best available source at Holyhead. On the Connaught the same measures were adopted, but the precaution of changing the water had not been taken. The "Ulster" is, at the present date, laid up, and is undergoing thorough purification.

Since October 7th, the only fresh case of choleraic nature that has occurred in connexion with these vessels has been the whitewasher, whose name stands fourth in the tabular list. At the present time, October 16th, the ships appear to be in a perfectly safe condition.

The water of the Connaught has now been changed. The supply of all the vessels will be henceforth got from Holyhead. The new water supply of that town is just ready. It is derived from the mountain, and is of perfectly good quality.

Cholera at
Holyhead.

Concerning Cholera at Holyhead.—For the past three weeks there has been much diarrhœa about Holyhead. A good deal of bilious diarrhœa had occurred through the summer, but this had subsided before September. The recent form of diarrhœa has appeared to be of a different and severer kind.

It will be seen in the first part of this report that on October 7th and 8th, several cholera cases were introduced into Holyhead from the mail packets. Besides such important cases, it is probable that a few cases of cholera had occurred in the town before October 11th, and one of them fatal. But on and soon after that day a number of cholera cases made their appearance almost simultaneously in various parts of Holyhead and its suburbs. They appeared unconnected with each other and in only one or two cases seemed directly traceable to communication with persons brought from the ships. Since this date there have been three or four deaths, and several persons are still ill. A few particulars of each case are appended:—

HOLYHEAD Cholera and Choleraic Diarrhœa in addition to Cases on Boats.

Case.	Date of Attack.	Apparent cause.	Disease.	Result.
1. Boy at Millbank -	Beginning of October.	Believed to have been	Cholera.	Death.*
2. Jones, landlord of public house.	Oct. 6	Unknown.	Cholera	Recovery.†
3. Girl at Millbank -	Oct. 6	Vicinity to previous case 1. (?)	Cholera	Recovery.
4. Woman at Llangoch	Oct. 12	Nursing Lewis from "Munster."	Cholera	Death, Oct. 12.
5. Woman in Baptist Chapel Street.	Oct. 11	Unknown.	Cholera	Death, Oct. 12.
6. John Jones's wife -	Oct. 12	Unknown.	Cholera	Convalescing, Oct. 16.
7. Emma Owen - -	Oct. 12	Unknown.	Choleraic diarrhœa	Recovery.
8. Emma Roberts' daughter.	Oct. 12	Unknown.	Cholera	Still doubtful.
9. Lady under Dr. Price (well-to-do).	Oct. 12	Unknown.	Cholera	Death, Oct. 13.‡
10. Case rumoured to have been attacked and died on Oct. 15.			No authentic information.	

* Case only thought much of when girl afterwards attacked.

† Previous diarrhœa two days.

‡ Had previous diarrhœa some days.

"Nothing in the analysis of the water would lead me to suppose that it could be injuriously impregnated with such matter. It is not a water that I should recommend as a source of domestic supply on account of its hardness. The salts which it contains are carbonates and sulphates of lime and magnesia and alkaline chlorides."

After cholera had occurred, Capt. Rogers, of the "Munster," suspecting the water, ordered all used for drinking purposes to be boiled. He reports the case of a seaman, Parry, who, on Oct. 3rd, drank some of the unboiled water in violation of orders, and who was soon after seized with diarrhœa, which the captain and himself imputed to the water. His attack was transient and not severe.

Upon the issue of the Order of Council of July 20th, the Guardians held no preliminary meeting and took no steps whatever. On October 8th the Chairman of the Local Board of Health, the Honourable W. O. Stanley, M.P., wrote to the Board of Guardians pointing out their responsibilities under the order; and on October 10th, Dr. Walthew, Parochial Medical Officer, also wrote to the guardians for instructions as to how he should deal with the cases of cholera that were in the town. No reply has been made to these communications; the Board of Guardians has taken no action, and has no intention of taking any action under the order.* Their next meeting will be held on Tuesday, October 23rd.

Cholera at
Holyhead.
Want of action
by guardians.

Cholera cases have been dealt with as cases of any other illness would be, and no special facilities have been afforded or precautions taken. The Local Board have however, herein acting with an authority conferred by the Order of Council, not on them, but upon the guardians, obtained from the harbour master a house in an isolated situation, to which they have removed the family of a man who died of cholera, and are making other arrangements with this and similar objects.

Action under the various sanitary laws has been taken in Holyhead, somewhat more vigorously for the last few months than usual, for previously these laws had been very ill administered. Latterly, however, and in great measure owing to the appointment of a new chairman, preparations are being made for real sanitary improvement in the town. Besides any action that the board may have recently taken, a real benefit to health has just been conferred on Holyhead, by the introduction into it of a new and pure water supply that will (it is intended) supersede the surface wells at present in use.

Sanitary action.

The actual sanitary state of Holyhead is about as bad as is possible, but there is not much overcrowding.

d. By Dr. Buchanan on Cholera at Pill, near Bristol.

In accordance with instructions, I visited the village of Pill, on the Avon, on the 18th and 19th November. I inquired into the sanitary condition of the place, and the action that had been taken under the Diseases Prevention Act, and offered advice to the committee of guardians of the Bedminster Union.

Pill lies on the sides of two hills, which slope to a stream in the valley between them. The houses are mostly in short rows, and have gardens on some open spaces in connexion with them. Among the gardens go two streamlets, which receive all manner of impurities, serving for the only sewers of the village.

The village.

The chief inhabitants of Pill, speaking as to numbers, are the Avon pilots who bring vessels up to Bristol. There are no well-to-do people, except the parson, the doctor, and the brewer. The cottages are much overcrowded, the family often occupying one bedroom, and letting off the other to single men as lodgers.

The privies of Pill consist either of a seat jutting over the edge of the river creek or the stream, or have the usual village arrangement of an open privy pit, great ponds of seething filth lying behind the privy. The vaulted cesspool is not in use.

The water supply of the village is procured from the streams—as it is alleged, for washing purposes only—at points where they appear less impure than elsewhere; and also from two pumps and one well which furnish the water for drinking. One of the pumps in the present summer instantly furnished chlorinated water upon the occasion of chloride of lime being thrown on a neighbouring muck heap. The other pump is half dry when the tide of the Avon is low, but furnishes water that is in good repute. The well is alongside the road, in a position that exposes it to contamination from surface filth and subsoil soakage.

* This statement was made by a guardian who was present at a meeting of the Local Board, and who was questioned in my presence by the chairman.

Cholera in Pill.

Occurrence of cholera.

Pill is wholly unpaved and intensely filthy. Human excrement, ash heaps, vegetable refuse, and every sort of dirt meet the eye at every turn.

The first two or three cases of cholera in Pill occurred in some low-lying parts near the river creek; the first of all being in the landlady of a public house frequented by sailors. Shortly after cases occurred in some houses abutting on one of the streams, which was known to receive night-soil from houses on a higher level. The main outbreak of the disease was between November 4th and November 7th. A list of cases shows 47 attacks of cholera and choleraic diarrhœa, with 16 deaths occurring between October 21st and the date of inspection.

The chief stress of the disease has been on the lower levels near the main stream, and in some rows every house was affected. "Under the Banks," alongside the river creek, was the row of houses that suffered most; three or four people were attacked in a house. The same locality was the scene of greatest prevalence also in 1849.

Action under Order of Council, by the "Vestry."

On Saturday, November 3rd, Mr. Lloyd, the parochial medical officer, informed Mr. Moore, the rector, that there had been two deaths that day from cholera. Mr. Moore conveyed this report to Mr. Mirchouse, one of the two guardians who had been constituted by the board of the Bedminster Union the sanitary committee for Pill. Mr. Mirchouse required Mr. Lloyd's statement to be authenticated by Dr. Budd of Clifton, who accordingly visited the place on Sunday evening, and saw several cases of cholera that had freshly broken out on that day, November 4th. Up to that time there had been no epidemic diarrhœa in the village.

A meeting of the "Vestry" of Pill was at once summoned, and met on November 5th, when Dr. Budd, and Dr. Tibbetts, of Bristol, were present. The vestry appointed Dr. Tibbetts to be their medical adviser, and proceeded to carry out the provisions of the Order in Council of July 20th. They acted thus under the belief that they were a legally constituted sanitary committee. Dr. Tibbetts had just had experience of the same sort of work in the Bristol Union.

Dr. Tibbetts brought with him a supply of disinfectants, two sanitary inspectors, and two nurses from Bristol (afterwards increased to five), and set to work energetically and thoroughly to carry out the regulations of Council, reporting from day to day to the vestry. He disinfected in a very perfect way every privy pit and collection of filth, beginning with the houses where cholera existed, and extending his operations all over the village. He established two dispensaries, and issued handbills telling people where to get diarrhœa medicines. Leaving the actual care of cases to Dr. Lloyd, he provided nurses, bedding, and all necessary comforts, saw to disinfection and destruction of infected clothes, and carried out arrangements for the speedy interment of the dead. Finding the boys of the village school suffering in considerable numbers (the girls comparatively escaped) from diarrhœa, he had all the children supplied with a good wholesome meal as well as with medicines daily. The water supply being wholly untrustworthy, the vestry, acting through Dr. Tibbetts, shut up the pump which yielded the obviously contaminated water, and employed carts to bring drinking water from a stream near Bristol, supplying it gratis to houses, and urging people to boil all water before drinking it. The vestry found a spring near the village issuing from the red sandstone rock at the rate of 72 gallons per minute; Dr. Herapath reported that this water was soft and free from organic matter, and on November 15th the vestry began to lay down pipes for conveying this water into the village. Facilities were given to the vestry by Sir W. Miles, on whose property the spring was found, by the engineer of the Bristol Water Company, who supplied pipes at cost price, and by the Railway Company which has works going on at Pill, and allowed its navvies to be employed in laying the pipes.

The Railway Company further gave the use of certain sheds for the reception of healthy persons from infected houses, and of a house for a dépôt of food, clothing, &c. No place could be got for a hospital at any price. Funds for the immediate wants of the village were rapidly supplied through the generosity of people in Bristol and Clifton.

It appears that shortly after July 20th, a sanitary committee for Pill had been appointed, consisting of the two guardians of the parish, and Mr. Lloyd was nominated as their medical adviser. But the committee did nothing on the occurrence of the first cases of cholera, and on the occurrence of the disease in alarming proportions on November 4th, they appear to have been merged in the "Vestry." Mr. Lloyd had never had any information of his appointment or of his duties in relation to the cholera. A sanitary inspector was also nominated who did nothing whatever, and as he only obstructed the action of the vestry, his services were dispensed with.

Cholera in Pill.
Action of
authorities.

On November 13th, after 12 deaths had occurred and the operations of the "Vestry" had been going on for a week or more, the Bedminster board of guardians appointed a special sanitary committee of seven members to deal with cholera in Pill, under the Diseases Prevention Act, and the Order of Council.

This special sanitary committee first met for the transaction of business on November 16th, and they adopted certain portions of the action of the vestry, continuing the services of Dr. Tibbett, the inspectors, and the nurses, and authorising the use of disinfectants. But they objected to the action that had been taken in superseding the old supply of water and in furnishing the village with new.

On November 19th, I met the special sanitary committee, having previously been in communication with Rev. Mr. Moore, Sir William Miles, and the two medical men who were working the preventive and medical arrangements. The result of this interview was that the committee resolved, and the guardians of the Bedminster Union adopted the resolution, "to accept as their own action all action that had been taken by the "so-called Vestry in giving effect to the law and to the Orders of "Council," including the arrangement for a new supply of water to the village.

Further action.

I have only to add, that what was done by the vestry under Dr. Tibbett's advice had demonstrably the effect of extinguishing cholera in the village of Pill. The number of new cases began immediately to subside, and in the few outbreaks that occurred after the vestry got to work, the disease was always limited to the individual attacked, and did not spread even to others in the same house.

Effect of pre-
ventive, &c.
measures.

e. By Dr. Seaton on Cholera at Carnarvon.

The outbreak of cholera in Carnarvon is a most serious one. In a small town of less than 9,000 inhabitants (8,512 by the census of 1861) there have been within the last five weeks not less than 60 deaths from this disease, and at the date of my inquiry (Dec. 22-23) there was no diminution in the rate of mortality.

Cholera in
Carnarvon.

I am not able to trace the introduction of the disease. On Oct. 5 a death is recorded from "diarrhœa" of a child, aged two years, residing in Crown Street, but no suspicion of cholera was then entertained. On Oct. 17 the death is recorded of a child, aged four years, residing in Turf Square, from "cholera"; the next death (the first case that attracted general attention, or I believe was looked upon as a case of genuine epidemic cholera,) was that of Mr. Hugh Owen, of Castle Square, on Nov. 7. After this there was not, according to the testimony of the medical practitioners of the town, any case, and there was certainly no death, until Nov. 20, when a fatal case occurred in Segontium Terrace, followed by two more fatal cases the next day. From this date the disease has gone on incessantly.

Commencement.

The mortality week by week (including five deaths entered as from diarrhœa or choleraic diarrhœa) has been as follows:—

Week ending Saturday, Nov. 24	-	-	6
" " Dec. 1	-	-	13
" " Dec. 8	-	-	9
" " Dec. 15	-	-	15
" " Dec. 22	-	-	17

Progress.

Cholera in
Carnarvon.

Up to the evening of the 21st above 400 cases of diarrhœa had been returned as treated successfully during this period by the district medical officers.

The disease has not been confined to any particular portion of the town, nor by any means limited to the very poorest people. The south-east corner of the town, however, has on the whole suffered as yet the most severely, one-third of the 60 deaths having occurred in Pool Street (a street on the road leading to Beddgelert) and three other streets on the slope between Pool Street and the Slate Quay on the river Seiont, viz., Wesley Street,* Baptist Street, and Chapel Street. In these streets there has been scarcely any, if any, house which has not had cases of cholera or diarrhœa. In the County Goal, situate in a narrow street at the bottom of the town, on the south-west side of it (*i.e.*, towards the Menai Straits), there have been, in a population of 30 prisoners, six cases of cholera, four of them fatal; and three or four cases of diarrhœa. The disease has never, with the exception of one or two cases in the Llandwrog district, extended beyond the limits of the town. In the Union House, situate on the outskirts of the town, there have been no cases.

Bad sanitary
state of the
town.

In Carnarvon there exists every thing that should invite and give intensity to an outbreak of cholera, or any other infectious or epidemic disease:—great overcrowding, and bad house construction; bad water supply; bad drainage; absence of privy accommodation; accumulation of surface nuisances.

Overcrowding.

1. *Overcrowding.*—This is of the worst kind; not merely are people crammed into houses too few to hold them, but the houses themselves are huddled together on a wholly insufficient space of ground. A large number of houses which I visited in company with the mayor and several of the leading inhabitants were without any windows or outlet at the back, and many of these were so placed (as in narrow courts) as to render free access of air in front impossible. H. Parry's Court was a striking example:—About 4½ feet wide, with narrow entrance, the houses (all without back outlet) being arranged on either side the court, the further end of which was closed and occupied by the privy. But in numerous houses having what are called back-premises these are so miserably confined as not to admit of proper ventilation. And the houses themselves are in many instances but miserable hovels, which ought to be closed as unfit for habitation.

It is quite certain that there is not in Carnarvon now the means of housing all the population, as human beings ought to be housed; but there is abundant building-space on the outskirts of the town, and it will be something gained out of the present calamity if it leads to energetic measures being taken for providing fit house-accommodation for the people.

Bad water
supply.

2. *Water supply bad both in amount and quality.*—The deficiency of quantity will be understood when I state that a suggestion of mine for flushing the courts was pronounced at once beyond the bounds of practicability. The quality may be judged from the sources; one of the chief of these is the river Cadnant, a brook which, coming down from the hills, receives, I am informed, the drainage of many farms and of part of the populous settlement of Bethel, *after which*, but before it enters Carnarvon, two water companies, the Vaynol Estate Company and the Quellyn Company, take their chief supply from it and distribute it, mixed I believe in each case with some water from springs, to the principal streets and houses in the town. That the water thus supplied, such as it is, undergoes no proper filtration, is clear from the fact that it oftentimes comes into the houses turbid. The water of these companies is not laid on to the courts and poorer streets; and a very large portion of the inhabitants have to fetch all their water from springs, of which there are several in the town. But from the porous nature of the soil, and the position of the springs with regard to houses and privies, suspicion reasonably exists

* It deserves notice that there was an outbreak of fever in Wesley Street in the summer.

that they too are tainted. Specimens of the companies' waters and of the principal spring water have been sent to Professor Miller for analysis.

Cholera in
Carnarvon.

I should state that the Town-Council are aware of the bad water-supply, and that a bill was obtained by them last session for bringing water of the purest quality, in quantity practically unlimited, into the town. Even the pipes have been purchased, but, if I did not misunderstand the mayor, the works are not begun. How far this delay has arisen from circumstances that might have been avoided I am unable to say, but I did not hesitate to express to the corporation my opinion that the gravest responsibility would be incurred by every day of unnecessary delay. Till this supply is got, not only have the people to go on drinking water which can scarcely be otherwise than dangerous, but the Town-Council, intending when it is obtained to compel owners to supply houses and courts with water-closets, suspend and have for some time suspended all action for compelling the provision of proper privy accommodation.

3. *Bad Drainage*.—Some of the streets have sewers (often untrapped), but a great, if not the greater, part of the town is without any provision for drainage. The Cadnant brook on entering the town becomes one of its chief sewers. Privies (where they exist) and drains are allowed to flow into it, and it is the great receptacle for the filth of all kinds which the privy-less people who dwell on its banks, or near it, choose to throw into it. At present, and with the heavy rainfall there has been, it is a rapid stream, but in summer and in dry weather it becomes a stinking ditch. In some parts of its course it is covered over and even built over; and in one house occupying this enviable position I noticed an ingenious contrivance (probably not limited to this house) of a trap-door in the floor for throwing filth directly into it and letting stench directly up.

Defective
drainage.

4. *Defective Privy Accommodation*.—The want of proper accommodation of this kind is shocking. One privy to 12 houses was the allowance in Harry Parry's Court; but there are courts without any privy at all, and others (which amounts to the same thing) in which the so-called privy is in an utterly dilapidated and unusable condition. Hence excrements are thrown out on ashpits, on dunghills, on the floors of yards, or anywhere where they can be most readily disposed of. The influence which such a state of things would have on the propagation of cholera is obvious.

Scandalous
want of privy
accommodation.

5. *Surface Nuisances*.—These great defects of water supply, drainage, and privy accommodation rendered all the more imperative a systematic inspection and daily removal of all *surface nuisances*; but, on the survey I made of the town, the abundance of filth everywhere met with testified to the inefficiency of the means adopted for this purpose. This subject had early in the spring excited the anxiety of the mayor, and two resident medical practitioners, Mr. Robert Jones and Mr. Watkin Roberts, had been requested to make a sanitary survey; on their excellent and practical report considerable action had been taken in the way of removal of dung, bones, ashpits, manure, swine, the cleansing of foul drains and privies, and the like; one of the main nuisances, however, the want of privies, being (for the reason I have mentioned) undealt with. But, unfortunately, after these cleansings in May, June, and July, things had been allowed to relapse till the deaths from cholera at the end of November, and a request of the Board of Guardians thereupon for more active cleansing, again roused the municipal authorities to action.

Surface filth.

If a prompt assent to this request and excellent resolutions and orders would have cleansed a town, Carnarvon would long before my inspection have been clean; but, unfortunately, it had not been deemed necessary to see to the execution of the orders given, or even, I fear, to provide the necessary force for carrying them out. There was no inspector of nuisances devoting to that work, as the circumstances of the town urgently require, his whole time; but this inspection had been made to devolve upon the borough-surveyor, an officer having abundance of other duties, and who besides, from illness, had been compelled to act by deputy; the scavenging force was inadequate, and though there existed, or was believed to exist, a sanitary committee of the Town-Council—an unwieldy body consisting of the whole corporation, minus those members who, being magis-

Want of proper
arrangements
for cleansing,
and of proper
supervision.

Cholera in
Carnarvon.

trates, might be called upon to adjudicate—it did not appear that since the resignation of the last and appointment of the present surveyor (in August last) they had ever been called together.

Before leaving Carnarvon I brought under notice of the mayor and corporation the course that should be pursued with regard to those defects that admitted of present remedy or alleviation. But so essential it is for the health of the town that works requiring time for their completion—works of water-supply, of drainage, and of privy or water-closet accommodation—should be set about *instantly* and prosecuted *zealously*, that I trust, that if any backwardness should be shown by the Local Board, means will be taken for calling into action the powers of “The Sanitary Act, 1866.”

I proceed now to state the action taken by the Board of Guardians on the outbreak of cholera. No time appears to have been lost by them in taking measures for carrying out the provisions of the Order in Council, and most of those provisions have been executed with admirable promptitude and zeal. If in two respects—two respects unquestionably of the greatest consequence—the action of the board has fallen short of what the emergency required, it was certainly not from a lagging or a niggardly spirit, but rather for want of due advice as to the energy, with which, under the circumstances, preventive measures were called for.

I premise that the ordinary division of the town for medical relief is into two districts, Mr. Foster being the medical officer of District 1, and Mr. Watkin Roberts of District 2.

Immediately on Mr. Owen's death (Nov. 7) Mr. John Williams, surgeon (partner to Mr. Watkin Roberts) was put in charge of the town, with two assistants, and instructions were given him to carry out everything required of medical men, or their assistants, appointed under the Order. After making inquiries which resulted in finding no other case of cholera, and not more than half-a-dozen cases of diarrhœa, Mr. Williams reported at the end of the week that their services were no longer requisite.

Upon the occurrence of the case in Segontium Terrace on Nov. 20, and of others about the same time, the poor law division of the town was had recourse to; but in addition to the services of the regular medical officers, Mr. Foster and Mr. Watkin Roberts, the partners of each, Mr. Jones and Mr. John Williams, were specially engaged. So that there were now two divisions, and four medical officers. On Nov. 24 a bill was extensively issued—placarded, and distributed also at houses—notifying these appointments, and informing the inhabitants that application might be made to these gentlemen for advice and attendance at any hour of the day or night. By Nov. 27 Messrs. Roberts and J. Williams were so overwhelmed with applications that they applied for further assistance, and immediately thereupon Mr. Edward Williams, a surgeon in the town, was engaged, and a part of Messrs. Roberts' and J. Williams' district separately assigned to him.

Subsequently to this, application was further made to the medical officers to ascertain if any more assistance was required by them to carry out the Order in Council; and the clerk was informed that none such was needed. Although Mr. Edward Williams on his appointment went at first from house to house, making inquiries as to the existence of diarrhœa and cholera, the work soon became too heavy for this, and he was obliged to restrict himself to the treatment of applications, or of cases he might hear of; and if either of the other medical gentlemen attempted any house-to-house visitation, he soon from similar causes gave it up. So that in fact there had not been in Carnarvon such house-to-house visitation as is required by Sect. IV. of the Order.

Mr. David Thomas, the relieving officer, had instructions to visit every cholera-house, to disinfect the privy, to sprinkle disinfectants about the rooms, and to leave disinfectants (carbolic acid and chloride of lime), in the supply of which there was no stint, with the inhabitants. He had, besides to superintend the limewhiting, the burning of bedding, &c., &c. He did all he could, and as much as few men would have accomplished; but having regard, under the peculiar circumstances of Carnarvon, to the extreme need of systematic and constant disinfection, other and special provision for this purpose had been necessary.

Action of the
Board of
Guardians in
carrying out
the Order in
Council.

No patients had been taken to the hospital; but a wing of the work-house cut off from all communication with the main building, and having a separate entrance, was ready for the reception of patients. Mr. Doyle, the Poor-Law Inspector, who was at Carnarvon, and with whom I had the pleasure of conferring, had sanctioned this appropriation of part of the building. It seemed to me well adapted to its purpose.

Cholera in
Carnarvon.

Of other measures it is not necessary to speak specifically, for everything seemed to me to have been done as well as it could be done. Medical aid appeared always to have been given with great promptitude, and the energy and labours of Mr. John Thomas, the clerk to the guardians, and the untiring zeal and meritorious exertions of Mr. David Thomas, the relieving officer, were really beyond all praise.

Besides those measures of immediate cleansing which, as already stated, I had to recommend to the Town Council, I made arrangements, before leaving Carnarvon, for division of the town into five defined districts, each under supervision of the already acting medical officer, but with appointment of a medical or other assistant in each district for the sole and express purpose of house-to-house visitation; for the separate appointment of disinfectors personally to disinfect in each house in which cholera or diarrhoea occurred; for notices throughout the town warning the inhabitants against drinking any water that had not previously been boiled; and I strongly advised the early removal of cholera cases to hospital.

Advice given.

A small committee of the Town Council will sit daily with the Committee of the Guardians, so that no time may be lost in taking action on any nuisances reported by the visitors or otherwise.

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